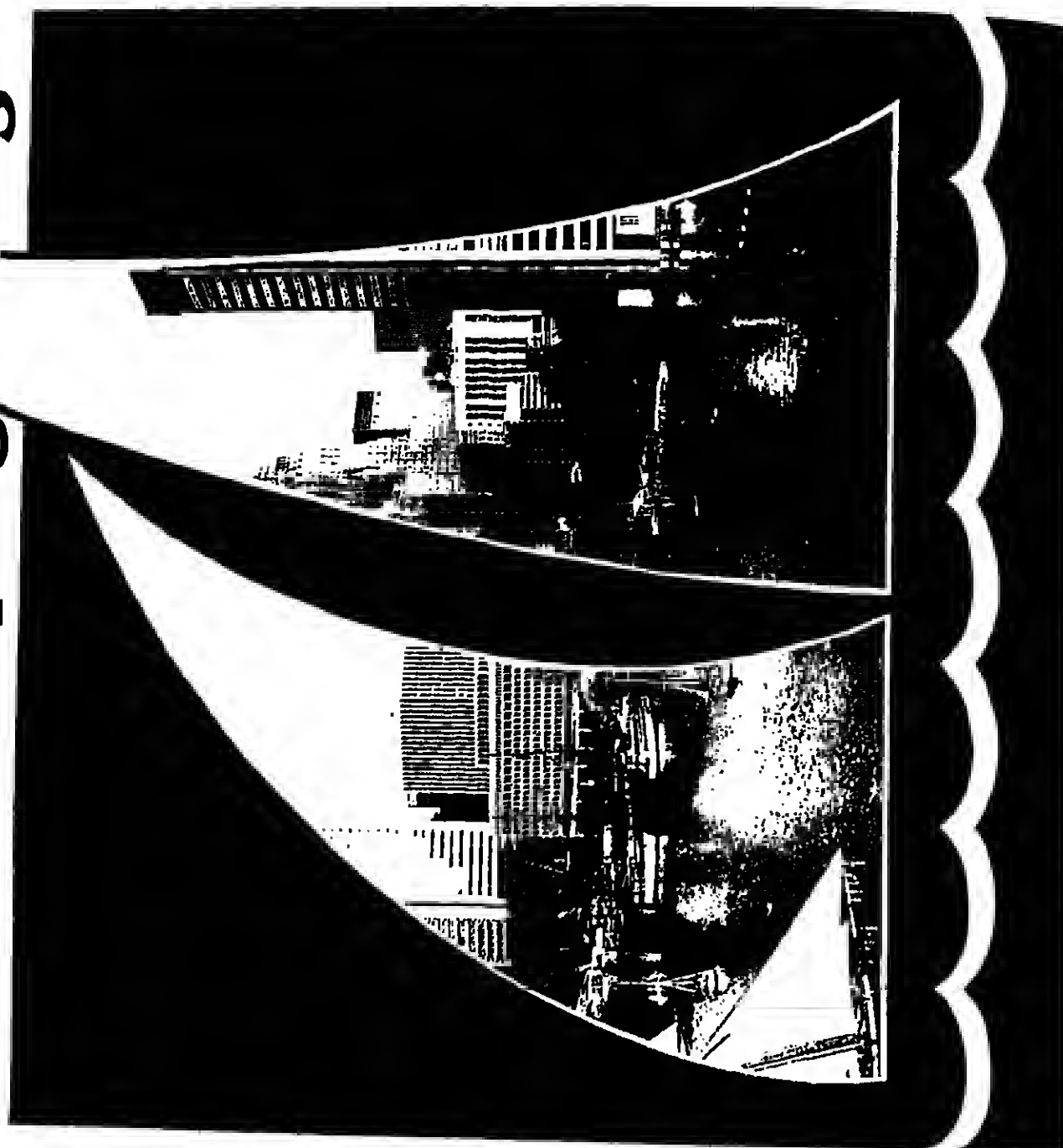


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1983 AGU Spring Meeting



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PROCEEDINGS OF THE LUNAR AND PLANETARY SCIENCE CONFERENCES

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William Boynton and Gerald Schubert, Proceedings editors

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Marcel Nicolet received his Ph.D. in astrophysics at Liège University in 1937. Since 1951 he has been associated with the Ionosphere Research Laboratory of the Pennsylvania State University, where he is an adjunct professor of astronomy. From 1953 to 1960 he was Secretary-General of the IGY. In 1960 he was director of Belgium's National Space Research Center and in 1965 became first director of the Belgian Astronomy Institute. He was president of the International Association of Geomagnetism and Aeronomy from 1963 to 1967. A retired professor of external geophysics at Brussels University and of space physics at Liège University, he has more than 200 publications in the fields of astrophysics, aeronomy, and meteorology and is a member or foreign associate of numerous professional societies and academies.

Historical Aspects of the IGY

Marcel Nicolet

Secretary General
Special Committee for the International
Geophysical Year

Editor's Note: During the week of September 25-October 3, 1982, an exhibition was organized at the Academy Palace in Brussels on Belgium's celebration of the 100th anniversary of the First Polar Year, the 50th anniversary of the Second Polar Year, and the 25th anniversary of the International Geophysical Year. It was dedicated to past and present geophysical activities in order to show the progress of future work. Five organizations took part in the exhibition: the Academy Institute, the Antarctic Research Committee, the National Geographic Institute, the Meteorological Institute, and the Royal Observatory. King Baudouin gave his sponsorship and visited the exhibition.

The following article is based on a speech delivered by Marcel Nicolet at the inauguration ceremony on September 25. The speech, entitled *Les travaux et les accomplissements de l'Année Géophysique Internationale*, was translated by G. M. Alamin, URSI Secretary General Emeritus.

Geophysics is a branch of science which has successfully integrated many different areas of research into a coherent whole. It represents the synthesis of various broad fields of knowledge relating to both the past and the present, and this provides a basis for speculating about the future. Since geophysical research must be pursued over the whole of our planet, into the most distant continents, and even across Antarctica, it calls for the application of all man's resources. It reconstructs the past through a process of reappraisal, reflection, and discussion; it elucidates the present and thereby leads us not only to image, to measure, and to study distant events, but also to understand better the mysteries of nature. Indeed, knowledge is the key which geophysics uses to open doors leading toward the future. Geophysics must also be accepted as a branch of fundamental research in which concerted action is an essential feature; it remains in contact with society by combining research and development and assesses the value of the knowledge acquired in terms of the contribution it makes to the welfare of mankind.

In the history of science, the first International Polar Year (1892-1893) was the first major event in which the fundamental concept was interdisciplinary cooperation on an international scale. Wegener, who conceived the idea of such a project, was obliged over a period of several years to defend his proposals and to promote them. It was not until a year after his death, and in spite of the outbreak of the war in the Balkans, that a small group of geophysicists of the period launched this first great peaceful enterprise.

In the wake of the heroic epoch of the First Polar Year, there followed many important developments in scientific instrumentation, and great improvements in communications within and between the continents. It was in 1927 that J. Gugi, a meteorologist, made the suggestion that the 50th anniversary of the First Polar Year should be celebrated in 1932. This led to the creation of a Special Commission which was made responsible for the Second Polar Year (1932-1933); its President was D. laCour, Director of the Meteorological Service in Denmark. The preparations for the event were confronted with many difficulties arising out of the world economic crisis of the 1930s; indeed on several occasions doubts were expressed about whether it was wise to continue, but finally these were overcome by the tenacity and the persuasive powers of laCour.

In the end, in spite of the practical problems encountered, the program for the Second Polar Year was carried out. Unfortunately, the outbreak of World War II in 1939 resulted in the suspension of normal international scientific relations. After the end of the war, in 1946, the Conference of Directors of the International Meteorological Organization, at its meeting in London, decided to dissolve all its Commissions. However, at its meeting in Paris in July 1946, the International Meteorological Committee cre-

ated the Polar Year Liquidating Commission; this body was made responsible for continuing the analysis of the data, which had already begun before the war, and for completing the task by December 1950.

In this connection it is important to recall that the President of the Liquidating Commission was John Fleming, President of the International Association of Terrestrial Magnetism and Electricity from 1934 to 1948, and also Director of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. Thanks to his worldwide reputation, Fleming was able to stimulate geophysicists into thinking about what future actions should be taken so as to give a fresh impetus to their branch of science. The range of new techniques already available, including the first rockets carrying scientific instruments, led them to give high priority to making observations in the third dimension. The need to think in terms of a new commitment of some kind was further strengthened by the approaching target date for the completion of the study of the data acquired during the Second Polar Year: December 1950.

It was in this atmosphere that, in January 1950, I visited the Department of Terrestrial Magnetism and the National Bureau of Standards in Washington, D.C., before spending 6 months in California. Just afterward, in fact on April 8, 1950, Lloyd Berkner made the first suggestion about the possibility of organizing a series of polar years separated by intervals of 25 years. At a meeting of about 20 scientists (Rues, Berkner, Chappman, Elvey, Kaplan, Nicolet, Rogné, Tuve, Van Allen, ...) in May 1950, held at Inyokern, China Lake, in the California desert, there was some discussion about various aspects of research in the upper atmosphere, during which ideas put forward by several participants were borne in mind.

These ideas were raised again in July 1950 at a meeting of about 200 scientists who participated in a "Conference on the Physics of the Ionosphere," convened by A. H. Wexler, of the Ionosphere Research Laboratory of Pennsylvania State University. On this occasion, some of those ready to go to Brussels were in favor of officially submitting the idea of a new "international polar year" to the Mixed Commission on the Ionosphere, which was due to meet in this Palace of the Academies September 4-6, 1950. This Brussels became the final point, 27 years ago, for the project which came to be known as the International Geophysical Year, 1957-1958.

The Mixed Commission (E. V. later Sir Edward Appleton as Chairman and a membership of Arno, Berkner, Beynon, Booker, Burrows, Macle, Haglund, Hamada, Herlitz, Knani, Lejay, Mattu, Massey, Meuzel, Nicolet, Shapley, and Waynick) forwarded its proposals to the scientific unions represented in it. These were approved by all the unions, including the IUGG, which held its General Assembly in Brussels in 1951 at the invitation of the Belgian National Committee for Geophysics and Aeronomy. In May 1952 the International Council of Scientific Unions (ICSU) formed the Special Committee for the International Geophysical Year, usually known under the initials of its French title: CSAGI. The members designated to represent the unions were: Berkner and Beynon (URSI), Coulomb and Larsen (IUGG), Norlund and Nicolet (IAU), and Wordie (IGU). Van Miegheem was later enlisted to represent the World Meteorological Organization.

The first official meeting of CSAGI was attended by the three senior representatives, Berkner, Coulomb, and Nicolet, and took place in Brussels on October 18, 1952. Through our Secretary, E. Herbays, we appealed to the national academies of sciences adhering to ICSU, as well as to the interested unions and the World Meteorological Organization (WMO), for their collaboration. At the same time, a request for financial support was made to the United Nations Educational, Scientific, and Cultural Organization (UNESCO).

The CSAGI met in this Palace from June 30 to July 3, 1953, at the invitation of our Academies, and by this time 30 national academies had already agreed to support the concept of the International Geophysical Year. Before the IGY began, general assemblies were convened in 1954, 1955, and 1956 in Rome, Brussels, and Barcelona respectively; the final Assembly was held in Moscow in July 1958.

The membership of CSAGI was made up of the representatives of the scientific unions, with the participation of the WMO. From its inception, the Committee had the responsibility for developing a practicable program of observations covering the various disciplines of geophysics. The diversity of the topics incorporated in the final program soon resulted in the inclusion of about 30 members in the Committee.

Accommodation for the General Secretariat of CSAGI was provided at Uccle, near Brussels, by the Radiation Service of the Royal Meteorological Institute in Belgium. The central direction of the program was entrusted

Editorial

Are You Listening?

After two and one-half years of knocking at your door, AGU-GIFT cannot be a stranger. The acronym, GIFT = Grilling For Tomorrow, should be familiar to all members of AGU. The number of members who have recognized GIFT with their contributions is increasing each year, yet we can hardly say that "the feast is ready."

At the time that the AGU headquarters building was purchased in 1980, it was known that there would be a mortgage of \$1 million-plus on which no major prepayment could be made prior to 1986. Some of us heard opportunity knocking. Could we respond? We knew that the membership of AGU includes a large number of retirees who are living comfortably within an upper-tax-bracket income plus many more members, still active, who prosper because of their careers in geophysics. We believed that AGU has contributed as much to this prosperity as any federal agency, university, or research institution. Why, then, should we not reinvest some of our dividends in the future of AGU?

We compiled a list of Senior Members—former officers, Medalists, committee chairmen—men and women who represented the professional heart of AGU. One of our major tasks was to challenge these members to respond in the initial knock at the door or every member solicitation by direct mail so that the example of their leadership would encourage others to contribute. We had visions of 50 or more members willing to respond with pledges or gifts of \$1,000 per year for 3 years. A few shares of stock that have doubled in value since last August would do the same thing. The question now is: these senior members—*Have you really been listening?*

Many listened and accepted the challenge. The number of Individual Supporting Members (ISAs) has been increasing steadily. In 1980 the number was less than 20—now the number is close to 130.

These are the members who contribute at least \$80 annually beyond their regular dues payment. They are demonstrating their support of AGU by a significant aspect of unselfish cooperation. Is it unreasonable to believe that a majority of the Fellows of AGU should be ISAs? The number of Fellows is close to four hundred, yet less than 15% of the Fellows are ISAs.

Those of us on the Steering Committee for AGU-GIFT—the dozen or so members who serve as the fund raisers for AGU—believe that *Eos* should be the messenger to carry the good news and the knock at your door. By using *Eos*, we eliminate a major cost—direct mailing. Also, the Steering Committee supports the use of the dues invoice to offer an opportunity for a voluntary contribution. Almost 3600 members accepted the opportunity offered by the 1982 dues invoice (mailed August 1981). For the 1983 dues invoice (mailed August 1982) the number is 3877, an 8% increase over the first year. There are always a few conscientious objectors to this procedure but they have not seriously offered any other method.

If you believe that you have listened well to the sound of opportunity knocking, look at the latest tabulation of the total giving by Sections. You must be encouraged by the percentage of participation but, more important, you should have some concern about the *average per contributor*. Surely AGU merits greater support. We want to assure you that the members of the Steering Committee remain their good natured. Moreover, we do sincerely appreciate the cooperation of all those who have been supporting the AGU-GIFT Program so generously. We have written our warmest thanks to these contributors and told them how much their continuing support benefits the Union. However, we are concerned. For the full membership, we go forward together and repeat our refrain: *Are you listening?*

Earl G. Drossler
Charles A. Whittem
Chairman
AGU-GIFT Steering Committee

AGU-GIFT Contributions as of April 18, 1983

Section	Number of Contributors	Percent of Members	Cash Received	Average per Contributor	Unpaid Pledges	Total Contribution
Atmospheric Sciences	414	41	\$14,849	\$35	\$ 530	\$15,379
Geodesy	218	39	14,545	67	5,765	20,310
Geomagnetism and Paleomagnetism	321	45	10,710	33	1801	12,511
Hydrology	877	35	17,929	20	1,424	19,353
Oceanography	653	33	13,189	20	1,827	15,016
Planetary Sciences	252	36	6,072	24	400	6,472
Seismology	589	40	11,845	20	380	12,225
Solar/Planetary Relationships	710	42	13,606	19	140	13,746
Tectonophysics	506	57	14,206	28	2,805	17,011
Volcanology/Geochemistry	508	34	11,111	22	300	14,411
Petiology						
No section	354	50	4,645	13		4,645
Friends			2,100			2,100
Commercial institutions			2,500			2,500
Designated for Merle Tuve Memorial—\$3,150						
Total	5,401	57	\$136,701	\$24	\$14,551	\$151,252

to a bureau, whose members were: S. Chappman, President (U.K.); L. Berkner, Vice-President (U.S.); M. Nicolet, Secretary General (Belgium); J. Coulomb, Member (France); and V. Belousov, Member (USSR).

In addition to the bureau, there were 14 discipline reporters, each of whom was responsible for one of the scientific disciplines. They are listed in Table 1, and their names and interests give some idea of the scope of the program as a whole. Finally, the CSAGI included several assistant scientific secretaries who were given the task of organizing a number of international conferences, each designed to deal with questions of particular interest to a geographical region.

For each of the disciplines, the program was first elaborated by a committee created under the auspices of one or more of the

unions and scientific associations adhering to ICSU. After this preliminary stage, the IGY program as a whole was studied by the bureau and by CSAGI, and was finally coordinated during the general assemblies, at which all the participating academies were represented, and also during the regional conferences mentioned earlier. Other conferences were held to discuss questions concerning related groups of disciplines. One of these, held in Washington, D. C. from September 30 to October 5, 1957, dealt with the problems of rockets and satellites and coincided with the launch of Sputnik 1, the first artificial earth satellite, on October 4.

It would not be possible here to review all the preparatory work carried out within each discipline. Briefly, each Reporter carried the responsibility for editing an Instruction Man-

TABLE 1. The Discipline Reporters of CSAGI

Activity	Reporters
World Days Meteorology	A. H. Shapley (U.S.)
Geomagnetism	J. Van Miegheem (Belgium)
Aurora and Algrlow	V. Laursen (Denmark)
	S. Chappman (U.K.) (with F. Roach and C. Elvey, both U.S.)
Ionosphere	W. J. O. Beynon (U.K.)
Solar Activity	Y. Ohman (Sweden)
Cosmic Rays	J. A. Simpson (U.S.)
Longitudes and Latitudes	A. Danjon (France)
Glaciology	J. M. Wordie (U.K.)
Oceanography	G. Laclavère (France)
Rockets and Satellites	L. V. Berkner (U.S.)
Seismology	V. V. Belousov (USSR)
Gravimetry	P. Lejay (France)
Nuclear Radiation	M. Nicolet (Belgium)



The CSAGI Bureau, IGY's international board of directors, at Uccle, near Brussels, June 1957. Left to right: V. Belousov of the USSR, L. Berkner of the United States, M. Nicolet of Belgium, J. Coulomb of France, and S. Chapman of the United Kingdom. (Photo by Leonis Dean, Life Magazine, ©1957 Time, Inc.)

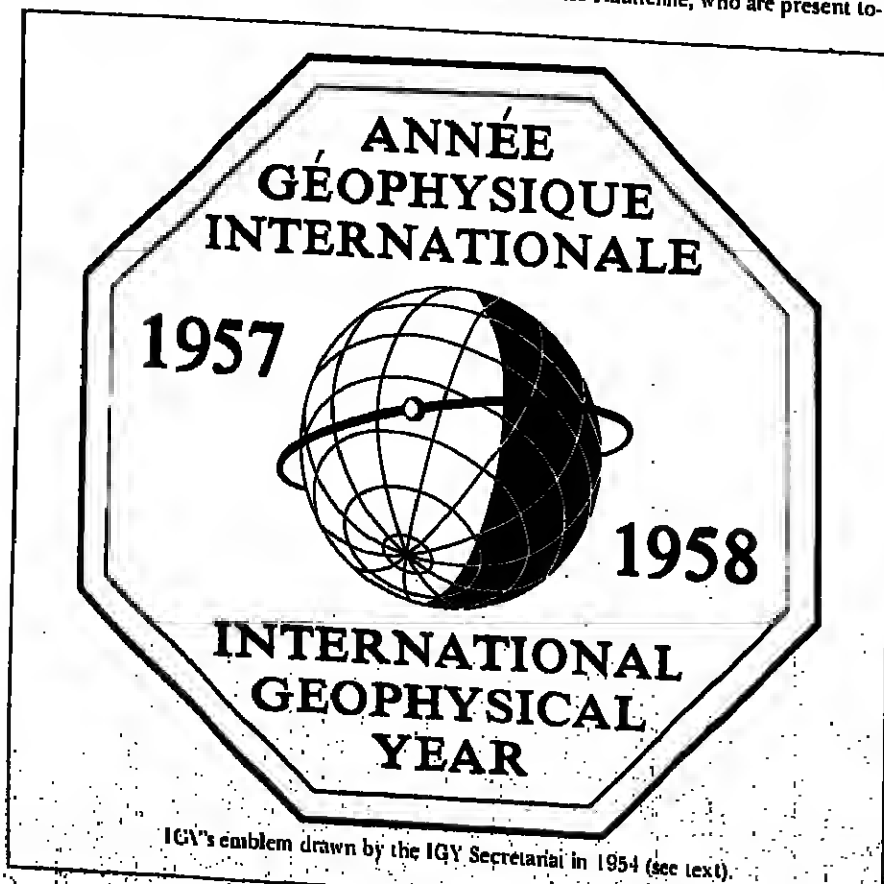
and containing sections prepared by experts. About a dozen of these manuals were distributed to the IGY participating committees before the beginning of the observational program, and were published in *Annals of the IGY*. In addition, each of the nations interested in the IGY had already sent out information on the essential elements of the programs with which it was concerned.

Because of limitations to the number of scientists and on the availability of equipment, not to speak of financial restrictions, attention was concentrated on three geographical areas: the Arctic, the Antarctic, and the equatorial belt. These satisfied certain geographical and geomagnetic conditions determined by the requirements of the various disciplines, and took account of the logistical facilities then available. In addition, three other zones were superimposed on those just mentioned; these were defined in terms of geographical meridians and corresponded to the continent of North America, Europe, Africa, and the Far East (or 140°E). Thanks to the decision to concentrate attention on certain geographical regions, it was possible to economize when deciding on the locations of new stations, while at the same time facilitating the acquisition of representative data for most geophysical phenomena.

Some idea of the vast scale of the preparations for the IGY can be gained from the fact that the first 10 volumes of *Annals of the IGY*, which were devoted to this aspect of the program, contain 5,000 pages.

It is worth recalling that, as early as 1953, the IGY Bureau had foreseen the possibility of launching artificial satellites in 1957 or 1958 during the IGY. Indeed, this was borne in mind when the IGY symbol was designed by the IGY Secretariat in 1954; it showed the trajectory of a satellite across a background of lines of latitude and longitude as well as the boundary between night and day, and it emphasized the privileged place given to it in Antarctica.

Here today, in the marble hall of this Palace, you will find the exhibition commemorating the 25th Anniversary of the IGY. It was in this same hall, at 6:45 P.M. on July 29, 1953, that the first announcement was made of the future launch of an artificial satellite. As Secretary General of CSAGI, I had that morning received, by special messenger, a letter from the President of the U.S. National IGY Committee. The news of the coming event was publicly announced in Brussels at the local time corresponding to the time of the official announcement made simultaneously in Washington, D. C. and in 40 countries participating in the IGY.



Forum

NASA and SEEP

In the recent news note by R. F. Harth entitled "Detecting Electron Precipitation" (*Eos*, March 22, 1983, p. 114), it is stated that NASA performed an experiment "similar" to the Navy's Stimulated Emission of Energetic Particles (SEEP) satellite program using sounding rocket X-ray detectors. The NASA effort was actually a cooperative part of the SEEP program that was, with the exception of the two small NASA rockets, sponsored entirely by the Office of Naval Research. The SEEP program originated at Los Alamos National Research Laboratory and Stanford University and was well along before Dr. Gohlberg at Goddard Space Flight Center and his colleagues at Cornell and the University of Denver were invited to participate.

Even the rocket launches were coordinated with the Navy and Los Alamos personnel, so that the NASA project was always dependent upon the Navy's SEEP program. We at NASA are pleased that SEEP was successful, and are proud to have been part of that overall success; however, the credit for the conception and execution of SEEP should go to the Navy and the researchers whom they sponsored at LPARL and Stanford.

John T. Linn
Earth Science and Applications
National Aeronautics and
Space Administration
Washington, DC 20546

Giving Through Life Insurance

Your Union's Gift Steering Committee has pointed out from time to time various methods of contributing to the Union that may provide certain members with the satisfaction of recognizing the value and attainment of the organization, and the part it played in the individual's career, combined with a maximum of convenience as well as tax and other advantages. One such method is to make the Union a beneficiary of one or more life insurance policies.

The committee recently learned of an example of such giving that seems so pertinent to the committee's thinking that it is here called to the attention of the membership. The example is a gift by The George Washington University (GW) and was discussed in some detail on page 3 of the November 1982 *GW Times* under the heading "Getting and Giving: Carol Brown's Story."

John G. Reed
AGU Gift Steering Committee

day, Sir Archibald Hay (Coordinator) and Sir Harold Spencer Jones (Editor of the *Annals of the IGY*) had died several years ago.

As for the results achieved during the IGY, it would be quite impossible to review them here since their description takes up 28 volumes of the *Annals*. The completion of this series of 35 volumes was made possible by the creation of the International Geophysical Year Committee (IGYC) after the dissolution of CSAGI in 1959. This Committee also laid the foundations for a new program of observation: the International Years of the Quiet Sun (IYQS), 1964-1965.

Before concluding, I must refer to the way in which a voluntary organization including representatives of 17 countries succeeded in steering such a complex project to a successful conclusion.

The first important achievement of the IGY was that it attracted the attention of thousands of men and women from all parts of the world who freely and spontaneously devoted their efforts to the attainment of a common scientific objective.

Besides this, the enterprise was able to benefit from the support of governments without itself being a governmental body; in addition it could count on logistical support provided by armed forces without being in any way military in character. Finally, although the IGY was based on international collaboration between scientists in 67 countries, it was able to avoid becoming involved with the rigid framework of established international organizations.

The IGY successfully attained its main objectives, but it would be wrong to conclude that the political conditions of the period were always favorable. I shall not refer here to various events, relating to the international political situation, which often complicated the task of those who were engaged in the direction of the enterprise; these might, perhaps, be a subject for another occasion. Today, I shall simply say that the geophysicists kept their feet on the ground and, although they were sometimes obliged to express disapproval, they never gave way. They kept their eyes firmly fixed on the ultimate objectives, and their will to attain these was sufficiently strong to enable them to surmount the

Carol Brown entered the university in 1977 while also working full time at the National Science Foundation. In 1980, before she had graduated, she suffered a very bad injury. She had to wear a cast brace and was in great pain for nearly 6 years. Her educational plans were completely wrecked. Nothing seemed to be back to work as soon as she was able, and in 1977 resumed her educational career part time at the university with much encouragement and help from friends in the faculty. She received a degree in history in 1981 and currently is working toward a master's degree.

A grateful Carol Brown has named several units of the university to benefit substantially from a life insurance policy that may have a value eventually of approximately \$75,000.

The article points out that, "The advantages of making a gift of life insurance to the university are many. The gift is tax-free, not open to contest, not subject to probate costs. The proceeds are payable immediately at death in cash, with the beneficiary or beneficiaries receiving all the proceeds."

"Since life insurance is given in small, regular amounts, . . . the donor benefits for the clarity over a long period of time. This convenience has made it easy for Brown, who lives on a fixed income, to provide her alma mater with a large, long-term average gift."

"A gift of life insurance is a personal, living donation. The donor can be more generous by giving life insurance because the proceeds are paid directly to the charity, thereby avoiding estate settlement costs. . . . In addition, once estate tax is diminished because life insurance is a very nature, creates small amounts to additional, separate estate."

And finally, "A life insurance gift is permanent. Numerous alumni and friends may already have on hand policies that have fulfilled their original purposes and could now be considered for charitable purposes. Changing the beneficiary and ownership of a policy is a relatively simple process. And by naming GW as policy owner and beneficiary, the donor can take an income tax charitable contribution deduction on the insurance premiums paid each year."

For those AGU members who wish to participate, AGU is soliciting input in paragraph just quoted "members" for "alumni" and "AGU" for "GW." It's a good thought.

John G. Reed
AGU Gift Steering Committee

national and the artificial barriers that have been erected.

In the final analysis, the IGY can be regarded as a remarkable out of which the science of geophysics emerged with new, permanent characteristics. It served to define certain guidelines, and these have since determined the directions in which modern geophysical research is now progressing. Today, the research is carried out in an atmosphere of international collaboration, the origins of which are unknown to the present generation. Every true geophysicist accepts this collaboration without hesitation and in a spirit of enthusiastic rivalry in the service of mankind.

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News

Keyworth Urges Setting Priorities

A strong advocate of scientists setting priorities within their disciplines, George A. Keyworth, II, President Reagan's science advisor and director of the Office of Science and Technology Policy, recently offered three possible consequences if such priorities are not set.

"I'm especially worried about the continued inability—or unwillingness—of the science community to agree among themselves about priorities—or to abide by their decisions when they can agree," he said emphatically. "I wouldn't think it necessary that I remind them that these are tough times. I'll add that for anyone depending on federal funding, they're going to remain tough, times for quite a while." Keyworth told the American Physical Society at its mid-April meeting in Baltimore, Md.

"There are three choices, none of them good," Keyworth continued. "It may be that funding increases will come to some consensus. Or decisions may be based on non-scientific factors such as preservation of politically popular facilities. Or disaffected minority viewpoints, when they're the dominant messages transmitted to the decision makers, may well carry the day. I come back to the central point: The community has to be willing to establish its own priorities and then stand by them in the public arena." —BTR

Copyright Suit Partly Settled

Amidst continuing confusion on what constitutes fair use photocopying of copyrighted material, the first legal action taken against an academic institution and individual professors for alleged violations of copyright law has been partly settled. Nine book publishers charged last December that New York University (NYU), several of its faculty, and an off-campus commercial photocopying establishment had violated copyright law. The action against NYU and its faculty was settled out of court. The portion of the lawsuit directed against Unique Copy Center will continue, however.

The suit, coordinated for the nine publishers by the Association of American Publishers (AAP), underscores the need for professors to understand the law concerning photocopying multiple works for classroom use and to understand when they must seek permission from a publisher before photocopying copyrighted material.

As part of the settlement, NYU agreed to enforce through December 31, 1985, classroom guidelines (see box) that were developed in 1976 by educators, authors, and publishers when the new U.S. copyright law was enacted. These guidelines are part of the legislative history of the law and are contained in a committee report of the U.S. House of Representatives. NYU agreed to spell out the policy in its faculty handbook, to investigate allegations of copyright infringement by its faculty, and to discipline faculty members found guilty of such infringement. The university has instructed its faculty to use these classroom guidelines to determine if copyrighted material may be photocopied. NYU also gave its faculty a procedure for determining when there is fair use beyond the guidelines, which state the minimum standards of the "fair use" doctrine: If the guidelines do not allow for photocopying, permission must be sought from the publisher. Faculty who have sought permission but feel they have been unjustly denied it should consult with university counsel. If university counsel is not sought, NYU says it would not defend the faculty member if litigation ensues.

Many university professors view the photocopying of material from journals and books for their students as essential. Often, many specialized subjects, professors copy journal articles and portions of books to fill the gaps in textbook material; to provide students with the research results from the frontiers of their field; and to ensure that a large class has access to key portions of the literature.

Carol Richter, AAP's copyright director, told *Eos* that AAP recognizes that photocopying to keep students at the frontiers of a particular academic field is a realistic teaching method and, as such, is not seeking to stop or limit photocopying. We want the copying to continue, but with [the necessary] permission," she emphasized.

Most of the confusion centers on the interpretation of the "fair use" doctrine of section 107 of the copyright law (P.L. 94-553), entitled "Limitations on exclusive rights: fair use." Four tests are applied to determine if a given instance of library photocopying is fair use: the purpose and nature of the use; the nature of the copyrighted work; the amount and substantiality of the portion used in relation to the work as a whole; and the effect of the use upon the potential market for or value of the copyrighted work.

To help eliminate confusion over section 107, the Ad Hoc Committee on Copyright Law Revision, the author-publisher group of the Authors League of America, and AAP established a set of guidelines for classroom copying, which are not intended to limit the types of copying permitted under the standards of fair use under judicial decision, according to the prologue to the guidelines. "There may be instances in which copying which does not fall within the guidelines stated below may nonetheless be permitted under the criteria of fair use."

AAP hopes that the suit and settlement will encourage other universities to adopt similar or identical policies to those adopted by NYU. AAP is pleased, Richter said, that the university is taking responsibility for the behavior and actions of its faculty and hopes that other universities will do the same. The Johns Hopkins University and Yale University already have recommended similar guidelines to their faculty.

AGU, an AAP member, has been trying to educate members about the copyright law and about the financial impact on journals that are widely photocopied, according to Judy G. Holmboe, AGU Director of Publications, Marketing, and Public Information. All AGU journals contain a copyright statement that begins, "Permission is granted for individuals to make single copies for their personal use in research, study, or teaching; and for short quotes and figures and tables from this journal for publication in scientific books and journals. There is no charge for any of these uses; AGU requests that the source be cited appropriately." For uses other than these, AGU participates in the Copyright Clearance Center and collects copying fees through them. The Copyright Clearance Center, located in Salem, Mass., acts as a centralized source for authorization to photocopy for 700 publishers and 6,500 titles.

Nine NYU faculty were named in the original suit; since then, one has died. The nine publishers involved are Addison-Wesley Publishing Co., Inc.; Basic Books, Inc.; Publishers; Houghton Mifflin Co.; Simon & Schuster, Inc.; Alfred A. Knopf, Inc.; Random House, Inc.; the National Association of Social Workers; Macmillan Publishing Co., Inc.; and Little, Brown & Co.—BTR

Law and Guidelines

The text of section 107 of the U.S. copyright law (P.L. 94-553):

"Notwithstanding the provisions of section 106 [exclusive rights in copyrighted works], the fair use of a copyrighted work, including such use by reproduction in copies or phonorecords or by any other means specified by this section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include—

- (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
- (2) the nature of the copyrighted work;
- (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
- (4) the effect of the use upon the potential market for or value of the copyrighted work."

Highlights of the classroom guidelines:

Teachers may make single copies for scholarly research or for preparations for teaching a class.

Multiple copies (not to exceed more than one copy per student in a course) may be made for classroom use if the copying meets tests of:

- brevity. The guidelines set word count limitations for poems, prose, illustrations, and "special works." Fitting into the guidelines' definition of brevity are, among others, works of prose of less than 2,500 words; excerpts of 1,000 words or 10% (whichever is less) of a longer piece; and "one chart, graph, diagram, drawing, cartoon, or picture per book or per periodical issue."

• spontaneity. Defined as copying "at the instance and inspiration of the individual teacher" and that the "inspiration and decision to use the work and the moment of its use for maximum teaching effectiveness are so close in time that it would be unreasonable to expect a timely reply to a request for permission."

• cumulative effort, which means that the copying is for only one course in the school, and, during one class term, not more than one short poem, article, story, essay, or two excerpts may be copied from the same author, nor more than three from the same collective work or periodical volume. For one course during one term professors may have a maximum of nine instances of multiple copying.

In addition, each photocopy must include a notice of copyright.

The guidelines clearly prohibit the use of photocopying to create an anthology, or to substitute or replace anthologies, compilations, collective works, the purchase of books, reprints, or periodicals. In addition, "There shall be no copying of or from works intended to be 'consumable' in the course of study or of teaching," including workbooks, exercises, standardized tests, and test booklets and answer sheets. Copying of the same item by the same teacher may not be repeated from term to term. Students will not be charged more than the actual photocopying costs.

"The guidelines, which are part of the legislative history of the copyright law, were developed in 1976 by the Ad Hoc Committee on Copyright Law Revision, by the author-publisher group of the Authors League of America, Inc., and by Association of American Publishers (AAP). The official and complete set of classroom guidelines is available free of charge from AAP, 200 Massachusetts Avenue, N.W., Washington, DC 20036. A booklet explaining library photocopying under the photocopying law, 'Photocopying by Academic, Public, and Nonprofit Libraries,' which was prepared in May 1978 by AAP and the Authors League of America, Inc., is available from AAP for \$2.

Apollo 18?

Allan Hills, Antarctica, was the site where meteorite sample ALH81005 was discovered recently, a meteorite in polar ice (*Eos*, November 30, 1982). Within the past few months there has been an intense effort by several groups of investigators in the United States and a few in Europe to analyze small fractions of what was initially a small (3 × 2.5 × 3 cm) specimen of the meteorite. The reason for the excitement is that ALH81005 has probably turned out to be a sample of the moon.

Results of the studies are the first tangible evidence that fragments of the moon's surface can be ejected and land on the earth. It is assumed that such a sample escapes from the moon's gravitation after ejection by impact of a meteorite on the lunar surface. It is also assumed, of course, that we know enough about the chemical and physical properties of the moon's surface rocks and minerals to make a positive identification of such a sample. The results of the studies go far beyond the testing of ejecta-trajectory calculations, mass-velocity distribution models, and earth-moon orbital dynamic theories. This sample may be the first evidence of the complex chemical and physical interaction of the earth-moon system.

For now, the excitement and focus of the investigations bears no state-of-the-art measurements and analysis to decipher ALH81005's intimate history. Referring metaphorically to ALH81005 as being the most recent Apollo mission, R. L. Korotev, L. A. Haskin, and M. M. Lindstrom of the McDonnell Center for the Space Sciences at Washington University, St. Louis, presented a discussion at the March Lunar and Planetary Science Conference 14 (LPSC 14) in Houston entitled "So Apollo 18 Flew, but Where Did It Sample?" According to them, the Allan Hills sample had a cosmic ray exposure age of no more than about 1.5 million years and a residence time in the Antarctic ice of no more than 600 thousand years, based on ¹⁰Be and ²⁶Al values. Compatible with an origin on the moon's surface is the analyzed ratio of FeO to MnO of 55.8 (which is determined in ALH81005 by several investigators and reported at an LPSC 14 special session entitled "Meteorites from the Earth's Moon.")

W. V. Boynton and D. A. Hill of the Lunar and Planetary Laboratory, University of Arizona, Tucson, stated at the conference that "More convincing data for a lunar origin of ALH81005 is provided by the abundances of incompatible trace elements." Their results, and those of other groups indicate a close alliance of ALH81005's patterns of rare earth elements to those of Apollo 16 Highland breccias. According to Boynton and Hill, "The presence of a KREEP type pattern in ALH81005 requires that this meteorite came from the moon."

Boynton and Hill acknowledge that the component of KREEP is specialized, extremely fractionated complement of potassium, rare earth elements, and phosphorus found in some lunar Highland rocks, although very closely identified with the moon and its history, could have formed from an identical body somewhere else in space. They conclude, however, that "It is most unlikely that this pattern could be established on another parent body unless it had a similar bulk composition, size, and thermal history as the moon. Such a parent body clearly does not exist in the solar system." Such a body could exist outside of our solar system, but even so, the exact conditions that would be required to cause the very extreme fractionations to produce KREEP would be immensely difficult to generate. On the moon, it is thought that the KREEP component fractionation product was formed only once and later was mixed into other rocks that now contain it, such as is observed in many lunar highland anorthositic rocks.

The oxygen isotope compositions show lunar patterns, according to the results determined on ALH81005 by T. K. Mayeda and R. N. Clayton of the Enrico Fermi Institute, Chicago, Ill., and reported at LPSC 14. In delineating this pattern as lunar, Mayeda and Clayton noted that differences in oxygen isotope ratios in various planetary bodies are established at the time of their accretion. The earth, the moon, and meteorite meteorites lie on a unique line when plotted on a three-isotope graph. All other extraterrestrial samples are either richer or poorer in ¹⁸O. According to Mayeda and Clayton, "ALH81005 is identical in isotopic composition with the Apollo 16 breccia, and is distinctly different from the eucrite samples. Of all the known sources of the solar system rocks, only the earth, the moon, and the aubrite parent body have oxygen compositions compatible with that of ALH81005," leaving the moon as the likely origin.

If rock fragments from the moon are being found on the earth, it should be possible to explain the processes of ejection and transport. H. J. Melosh of the Lunar and Planetary Laboratory concludes that "both theory and experiments suggest that significant amounts of ejecta may even exceed the es-

cape velocity of the moon... (LPSC 14). On the basis of observations of explosive behavior, some nuclear, Meloni was able to calculate that fragments relatively free of shock damage are "spalled off" at the edges of impact craters, the particle size being related to the physical properties of the impacted lunar surface.

Once at velocities exceeding lunar escape, lunar surface ejecta could follow several routes. According to D. E. Gault of the Lunar Science Center of the University of California, it is estimated that the moon is currently losing 10^{10} – 10^{11} grams/yr. Of this total mass loss it appears that no more than 10^7 – 10^8 grams/yr are accreted by earth, the total derived from both direct trajectories and the "cloud" of geocentric orbits destined to be of the order of 10^{10} – 10^{11} grams.

The origin, the process, and now a sample whose compositional intricacies devolve to a lunar formula, set the scene for a transplanetary system.—PMB

New Funds for Major Equipment

Earth sciences laboratories in the academic world have been in desperate need to replace, improve, or otherwise obtain research apparatus in recent years. The grants available from federal government agencies have not allowed for major equipment purchases, but very recent changes in fund allocation now provide for the purchase of major apparatus for analysis, experimentation, field studies, and for computation and data processing in the earth sciences. Such equipment is described by a guideline brochure recently released by the National Science Foundation (NSF), Division of Earth Sciences, as being "unusually too expensive and of too broad potential use to be adequately justified by a regular research proposal." To initiate the program, NSF has allocated \$5 million for earth sciences equipment in fiscal year 1984.

There are a few key factors to be considered in applying to the NSF for major research equipment. The title for such a proposal should read "Acquisition of..." followed by "...or Development of..." which would imply that money for new, refurbished, or converted apparatus is being requested. The equipment must be initially intended for a well-defined research project that must be described in detail. Institutional contributions in the form of matching funds and supporting costs would help the application.

The deadline for submission of proposals is September 1, 1983. This provides a relatively short time to prepare a major proposal. A description of the facilities available from the Data Support Services Section, EAR-EQ, NSF, Washington, DC 20540, or by calling Ian MacGregor, Deputy Director, Division of Earth Sciences, at 202-357-0201.—PMB

Knapp Confirmed As NSF Director

Edward A. Knapp was confirmed by the Senate in a voice vote on April 13 as the director of the National Science Foundation (NSF). The Senate vote followed a confirmation hearing by the Senate Labor and Human Resources Committee. Knapp, who was nominated by President Reagan to head the foundation in November, had been assistant director for NSF's mathematical and physical sciences (MPS) Directorate since July 1982.

Allegations that he has been politicizing NSF have beleaguered Knapp since he asked for resignations or firm commitments to leave from three NSF top administrators in December. Two of these administrators had been planning to leave, through an resignation letter had been sent. Knapp assured the Senate committee during the April 13 confirmation hearings that he made the decision to ask for the resignations and that, although he had discussed his plans with Office of Science and Technology Policy officials, they did not request that certain people be removed in exchange for particular increases in the NSF budget. Knapp insistently has defended himself against the allegations by saying that he wants his own team at the agency.

The NSF director also said that he expects to forward to the White House by early May a list of nominees for two other posts: the assistant director for astronomical, atmospheric, earth, and ocean sciences (the post currently held by Francis S. Johnson), and the assistant director for MPS, which had been vacated by Knapp. Nominees for the assistant director for biological, behavioral, and social sciences, soon to be vacated by Eloise E. Clark, would follow soon after that.—BTR

Clash Over NOAA Budget

At the April 26 hearing on the National Oceanic and Atmospheric Administration's (NOAA) budget by a Senate Appropriations subcommittee, Sen. Lowell P. Weicker, Jr. (R-Conn.), derided the budget cuts proposed by NOAA and the Reagan Administration. "I think it would be almost criminal" to agree to the proposed cuts, Weicker said, adding that although he understands the broad policy to trim the budget, the proposed cuts amounted to "piecemeal emasculation... I won't be part of it."

"I cannot help but note with regret that for the third year in a row the Administration proposed drastic reductions in ocean-related research and development," said Weicker during the hearing conducted by the Senate Appropriations Subcommittee on the departments of Commerce, Justice, and State, and the Judiciary. "The proposal 37% cut in funding for fisheries programs combined with a 40% cut in other oceans and coastal activities would add up to an \$85 million loss for NOAA's oceans programs. To make cuts of this magnitude would be, in effect, to write off the great potential the oceans have for feeding our people and helping in power our economy," the Connecticut senator said. "In short, the potential of the oceans as well as the pressures placed upon them have never been as great and they will be even greater tomorrow. In the face of Administration indifference and outright hostility, Congress must maintain its commitment to the oceans and to the positive contributions they can make to our future."

The flip side of the coin was presented by NOAA Administrator John V. Byrne: "I believe our budget represents a balanced approach maintaining essential services in light of the need to exercise fiscal restraint. This budget will result in many changes from the way we have operated in the past, but these changes are for the better—changes that will make NOAA more efficient in meeting our mandated responsibilities." Byrne also said that the cuts to ocean and coastal programs were made after looking at the overall agency budget, though his personal bias would have been to increase the ocean and coastal programs.

When queried by Weicker about the proposed termination of the Sea Grant program, Byrne told the subcommittee that he would question the success of Sea Grant. In fact, the Administration felt it was because of its success that the program would be picked up readily by the private sector. Weicker responded that by following such reasoning, the National Institutes of Health would be eliminated also. "I can assure you there will be a Sea Grant program," Weicker said. "I probably gave the highest number of people and states involved for the lowest number of dollars, he added.

House hearings on the NOAA budget were completed last month. Budget markup sessions in the House were to be held in early May. The Senate markup probably will not be held until the end of the month.—BTR

Geophysical Events

This is a summary of *SEAN Bulletin*, #31, March 31, 1983, a publication of the Smithsonian Institution. The entire *SEAN Bulletin*, which is published by the Smithsonian Institution, is included; also included here is the report on Asama, which will appear in volume 8, number 4. The earthquake report is an excerpt.

The complete bulletin is available in the microfiche edition of *EOS* as a microfiche supplement or as a paper reprint. Subscriptions to *SEAN Bulletin* are also available. For the microfiche, order document E83-104 at \$2.50 from AGU Fulfillment, 2000 Florida Avenue, N.W., Washington, DC 20039. For reprints, order *SEAN Bulletin* (give volume and issue numbers and issue date) through AGU Separates; \$3.50 for one copy of each issue number for those who do not have a discount account; \$2 for those who do; additional copies of each issue number are \$1.00. For a subscription, order *SEAN Bulletin* from AGU Fulfillment. The price is \$18.00 for 12 monthly issues mailed to a United States address; \$28.00 (U.S.) if mailed elsewhere. Order must be prepaid.

Volcanic Events

Kilauea (Hawaii): Eruption continues in middle rift zone. Etna (Sicily): Lava from S flank fissure; central crater enlarged. Mt. St. Helens (Washington): SO₂ emission, seismicity, and changes in morphology of new lobe may indicate continued endogenous growth. Long Valley (California): Seismicity declines to near background. El Chichón (Mexico): Continued monitoring of stratospheric cloud. Klyuchevskoi (Kamchatka): Earthquake swarm then lava flow from NE flank vent. Asama (Japan): Incandescent tephra ejected; ashfall to 260 km.

TRAVEL TO IUGG GENERAL ASSEMBLY



AGU has arranged inexpensive group flights to the 18th General Assembly of the International Union of Geodesy and Geophysics August 15-27, 1983 Hamburg, West Germany. Departures have been booked on

on August 13, or you may choose from a wide variety of other available flights. Group rates are available from most major American cities (from \$619 round trip East Coast). For reservations and information, call



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Pagan (Marina Is.): Tephra deposits suggest 4-7 eruptions since May 1981. Ulmanu (New Britain): Increased seismicity and vapor emission. Manam (Bismarck Sea): Explosions, ash emissions, and seismicity increase. Langila (New Britain): Activity declines. Hunter Island (New Hebrides): Vapor, ash, and burning vegetation. Marlow Island (New Hebrides): White vapor from central crater.

Ruapehu (New Zealand): Deflation and B-type earthquakes. White Island (New Zealand): No eruptive activity; B-type events increase. Erebus (Antarctica): Lava lake level drops slightly; explosion earthquakes; earthquake swarm near area of 1908 thermal activity. Mt. Melbourne (Antarctica): Fumarolic activity unchanged since 1972. Rincon de la Vieja (Costa Rica): Tephra eruption from crater lake. Arenal (Costa Rica): Lava extrusion continues.

Poda (Costa Rica): Fumarole and crater lake temperatures higher. Soufriere (Guadeloupe): Water temperatures and chemistry.

Of Doinyo Lengai (Tanzania): Reported February lava flow not found; strong gas emission; small ash-poor plumes. Etna (Sicily, Italy) (37.73°N, 15.00°E). All times are local (UT + 2 h). Most of the following is from a report by Romolo Ruvino. A destructive south flank fissure eruption began on March 28, preceded by a series of strong earthquakes first felt during the night of March 26-27. At about noon on the 27th, a strong smell of H₂S was noted from an old cone roughly 2 km S of the initial eruption. Seismicity continued through the following night. At about 0845 on March 28 a SSW-trending elliptical fissure opened from about 2450 to 2250 m altitude, roughly 4 km S (bearing about 170°) of the central crater.

The fissure and the E side of this fissure fed several lava flows that initially moved toward the SSE and SSW then turned S. Weak explosive activity along the entire fissure ejected modest quantities of lava fragments. By evening, the main flow had overrun a road and several buildings.

During the morning of April 1, vigorous emission of gas, ash, and old lava, accompanied by occasional phreatic explosions, began from 2 explosion craters upslope at 2700 m altitude. At the end of the day, explosions from the southern vent ejected lava fragments. On April 2, nearly constant lava production formed a 500-m-wide lava field extending to 1900 m altitude. As of April 3, the lava had not advanced below 1450 m altitude, 5.5 km from the fissure. At least four principal effusive vents were active along the 750 m fissure and from its upper part strong gas emission with sporadic explosions occurred at about 300 m.

Bands of open fractures, oriented about N-S, extended from the central crater area to the eruptive fissure. A substantial widening was noted at the S rim of Bocca Nuova; the western of Bocca's two central craters and site of frequent collapse activity since Etna's last eruption in March 1981. Strong vapor emissions from Bocca Nuova sometimes included abundant ash. There was no activity from the NE and SE craters.

The temperature of the lava was less than 1100°C and its chemistry (phonolitic tephrite) was similar to that from some of the more recent eruptions. An area of more than 1 km² was covered by lava and the volume was estimated at about 8 × 10⁶ m³. The lava

Internazionale di Vulkanologia considered the eruption to be a typical slow subterranean type. The last activity of this type on the S flank was in 1780. Effusive activity had diminished by April 8 but on April 9 a lava flow 300 m wide and 4 m high was advancing down the S flank and seismicity continued. The lava destroyed a cable car system that was one of Sicily's most important tourist attractions, and destroyed or seriously damaged more than 20 buildings.

Information Contacts: Romolo Ruvino, Istituto Internazionale di Vulkanologia, Viale Regina Margherita 6, 35123 Catania, Italy; Maurizio Krull, Equipe de Volcanologie, UFR, B. P. 5, 68701 Colmar, France; Colard Press International, Agence France Presse, Kitchershoof, Antwerp, Belgium; USSR (50.15°N, 160.75°E). An earthquake swarm on the NE flank of Klyuchevskoi began February 28. The majority of the events had focal depths less than 10 km. Summit elevation is 4850 m and their maximum magnitude was 3.1. Based on the swarm's character, the Institute of Volcanology predicted that a flank eruption would start between March 4 and 8. On March 8 a crater opened at 3000 m altitude on the NE flank. Activity from the crater was purely effusive, producing an andesitic-basaltic flow that was 3 km long by March 18.

Information Contacts: B. V. Ivanov, Institute of Volcanology, 119 Avenue 9, Petrograd, Krasnodar, 350006 USSR. Asama (Volcan, central Honshu, Japan) (36.10°N, 138.53°E). All times are local (UT + 2 hours). An explosive eruption occurred from Asama's summit crater April 3. Local seismic activity had increased in mid March. In early April high-frequency B-type earthquakes and volcanic tremor were observed more frequently than usual.

The eruption began at 0159. The air shock (amplitude, 0.2 millibars) and eruption crater quake (amplitude, 125 microns) were recorded at the JMA Kariwaza Weather Observatory (7.7 km SSE of the crater). Observatory personnel heard the thunder-like sound that accompanied the explosion, and observed the ejection of an incandescent tephra column. During the next 11 minutes, four more eruption earthquakes were recorded; seismic activity then declined rapidly. Only two volcanic earthquakes were recorded between the initial explosion and 0600, when most activity had ceased.

By 0450, when the summit was first visible from the Observatory, a 600-m-high, gray plume was being blown WSW from the summit. The wind soon reversed, and ash was carried ENE. Near Ko-Asama, a lava dome about 3 km E of the summit, 2.7 kg m⁻² of tephra accumulated, including lapilli as large as 1 cm in diameter. By 0600 activity was limited to a 300-m-high vapor plume. No further explosions had been recorded by sunset. A forest fire started by the incandescent tephra on the S flank of Asama was extinguished by 0430.

Asama's last eruption was a small explosion on October 2, 1982, 2 days after a sudden increase in seismicity. Information Contacts: Office of Volcanic Observation, Seismological Division, Japan Meteorological Agency, 1-3-4 Ote-machi, Chiyoda-ku, Tokyo 100, Japan. Hunter Island (New Hebrides) (16.0°S, 160.75°E). All times are local (UT + 11 hours). A Vanuatu Government team visited Hunter Island on March 9 at 1800. White vapor tinged with gray ash billowed to an altitude of approximately 900 m.

from the main active crater on the W side, and drifted to the W and NW. Fumaroles and two small superheated craters on the SE side were also faintly. Vegetation on the SE slopes of the E coast was burning, which suggested that the eruption had begun recently. By 2200, the lava had reached the central spine of the island and could be clearly seen from the anchorage on the NW coast. The last reported eruption of Hunter Island was November 24, 1982. Aerial photos of Hunter taken in June 1979 showed no activity.

Information Contacts: A. McFarlane, Director, Department of Geology, Mines and Rural Water Supplies, GPM, Port Vila, Vanuatu.

Earthquakes

The March 18 earthquake was the strongest to occur in the New Guinea-Solomon Islands area in 12 years, but no casualties were reported and the only major structural damage

was the collapse of a concrete pier at Muliana on the E coast of New Ireland about 100 km NW of the epicenter. Four small tsunamis with a maximum amplitude of 25 cm were recorded between 0945 and 1145 UT in Rapaui harbor about 170 km WSW of the epicenter. Landslides and snow avalanches triggered by the March 25 earthquake about 80 km NE of Teluk killed about 90 motorists and injured about 40 on the Harz highway between Teluk and Amol, on the Caspian Sea. Two mountain villages were reportedly leveled, with about 10 persons dead. Another shock the next day, in virtually the same place, caused more injuries and damage. At least 225 persons were killed in Popayan, capital of Cauca department, by the March 31 earthquake. In nearby towns, including Pienlan, Morales, and Timbina, 16 were killed. About 1500 were injured, 100,000 left homeless. The widely felt shock destroyed 80% of the city, including the airport runway. The epicenter was almost beneath the city, and the MMI there was VIII.

Information Contacts: National Earthquake Information Service, U.S. Geological Survey, Stop 967, Denver Federal Center, Box 25146, Denver, Colorado 80225 USA; P. Lowenstein, Senior Government Volcanologist, Raul Volcano Observatory, P.O. Box 386, Raul, Papua New Guinea; J. Rafael Gubernia, S.J., Universidad Javeriana, Inst. Geofísico, Cra. 7, No. 40-62, Apartado Aéreo 56710, Bogotá, D.E., Colombia; Islamic Republic

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For further information, call toll free 800-328-7110 or, in the Washington, D.C. area, 462-6903.

POSITIONS WANTED

Hydrogeology/Environmental Scientist. Ph.D. research associate seeks research position. Research areas include soil water dynamics, watershed modeling, hydrogeology, environmental geology, and water resources. Graduate degree in Hydrogeology, B.S. in Geology, M.S. in Hydrogeology, U.S. Geological Survey, Reston, VA. Would consider a post-graduate position. NRI facilities.

Hydrogeology/Geo-Engineer. Geo-Engineer with 10 years experience in groundwater, soils engineering, geotechnical engineering, and environmental engineering. Experience in operation of NRE, NRI, and/or in environmental engineering. Willing to relocate. Send resume to: Dr. Klaus Jochims, Lamont-Doherty Geological Observatory, 61 Rte. 9W, Palisades, NY 10964.

POSITIONS AVAILABLE

Seismologist. Lamont-Doherty Geological Observatory of Columbia University seeks a seismologist with research interests in tectonic and computational methods. Appropriate degree, M.S. or Ph.D. from a major research group at a university. Participation in ongoing research program and directed by Lamont-Doherty Geological Observatory. Depending on applicant's experience and qualifications the position will be filled at either the postdoctoral or associate research scientist level. Send resume with qualifications or references to: Dr. Klaus Jochims, Lamont-Doherty Geological Observatory, Palisades, NY 10964.

Columbia University is an equal opportunity/affirmative action employer.

Structural Geology/Petrology. Lafayette College seeks a person to teach undergraduate physical and structural geology, igneous and metamorphic petrology, and additional courses, dependent on applicant's interests. Ability to teach introductory geology is desirable but not mandatory. Teaching load averages two to twelve contact hours and two courses/semester. Appointment as assistant professor (Ph.D. state). Send resume to: Dr. Klaus Jochims, Lamont-Doherty Geological Observatory, Palisades, NY 10964.

Send application and resume, and arrange for three reference letters. Dr. Klaus Jochims, Department of Geology, Lafayette College, Easton, PA 18042. Lafayette College is an equal opportunity employer. M/F. Women and minorities are encouraged to apply.

University of Colorado, Boulder, Geomaterials Position. Geomaterials with active research interests in geology, geophysics, and geotechnical engineering. Research is being sought for a joint appointment in the Department of Geological Science and the Cooperative Center for Research in Environmental Science (CRES) of the University of Colorado. The one-half time position within the Department of Geological Science is tenure track at the assistant professor level with a starting salary of \$21,000–\$23,000 for the academic year.

Teaching load will be half that of full-time faculty. The position within CRES will be as a Fellow. Who appoints office and laboratory space. One CRES for two years salary will be guaranteed by the University. Incumbent may augment salary further by generating three months of summer salary from contracts and grants, and consulting.

Applicants with experience, publications, and/or notable teaching research experience preferred. Preferred starting date would be January 1, 1984. Closing date for applications is October 1, 1983. Applications should include statement of research interests, teaching interests, a full vitae, and four letters of reference.

Apply to: Professor Charles Stern, Chairman, Geological Sciences, Campus Box 260, University of Colorado, Boulder, CO 80509. The University of Colorado is an equal opportunity/affirmative action, Section 504 employer.

Fellow in Geochemistry and Isotope Geochemistry. The Australian National University invites applications for FELLOW IN GEOCHEMISTRY/ISOTOPE GEOCHEMISTRY, RESEARCH SOCIETY, 1983-1984. An established scientific reputation, experience in the use of radiogenic isotopes particularly of uranium and thorium, and proven ability to manage projects involving chemical and/or spectroscopic techniques are essential. Salary in accordance with qualifications and experience within the range \$20,148–\$23,081. Current exchange rates: \$A1 = \$US0.86 = £3.79.

Appointment will be for an initial period of five years with the possibility, following review, of reappointment to tenure age. Grants are provided towards travel and removal, assistance with housing, superannuation.

The University reserves the right to make an appointment or to make an appointment by invitation at any time.

Applicants may obtain further particulars from The Registrar, The Australian National University, P.O. Box 1, Canberra, Australia, with whom applications close on 21 June 1983.

Research Associate. The Stanford University School of Earth Sciences and the Center for Materials Research seeks research associates to work for an annual three-year appointment to start approximately in October 1983 whose responsibilities will include: (1) Seismicity and maintenance of a new NRI-NRI facilities; (2) Supervision of a new EDC spectrometer; and (3) Interaction with our multiple technique in geophysical research for geological applications.

Send resume to: Dr. Klaus Jochims, Department of Geology, Stanford University, Stanford, CA 94305. Stanford University is an equal opportunity/affirmative action employer.

Research Assistantships for Studies in Air Pollution and Atmospheric Chemistry/Washington State University. For M.S. or Ph.D. in Engineering or Environmental Science. Graduate degree programs can also lead to specific degrees in Chemical Engineering, Mechanical Engineering, or Environmental Engineering. The Director of the program can be designated to fit student background, special interests, and experience.

Current research projects include: Ammoniacal acid and sulfuric acid and nitrogen oxides, pollutant transport, tracer studies, complex terrain modeling, long-term emissions, global atmospheric chemistry, and atmospheric monitoring.

Candidates are sought with M.S. in meteorology or geophysics, or chemistry, physics or engineering. Stipend is \$6,900/line month; \$1,500/line in some cases. Tuition assistance available in suitable candidates. September 1983 and February 1984 enrollment deadlines.

Contact: E. Robinson, Air Pollution Program, 300 Dana Hall, Washington State University, Pullman, Washington 99164-2730 or telephone collect for Washington 509-335-1585.

EO/AAE.

Mesoscale Research Section of the Atmospheric Analysis and Prediction Division (AAPD) of the National Center for Research in Boulder, Colorado is recruiting for Scientists 1 or 11 to do basic research studies on small-scale or mesoscale meteorology. The research will be selected and defined in collaboration with the senior staff. The primary emphasis will be in advancing the fundamental understanding of important mesoscale processes and their interactions with smaller scales of motion. Both theoretical and observational studies will be encouraged; the main goal is to improve the skill of mesoscale forecasting.

REQUIREMENTS (LEVEL 1): Ph.D. dissertation or equivalent research contribution in meteorology or related field. Demonstrated experience in small-scale or mesoscale meteorology. Demonstrated skill in effective written and oral communication. Strong mathematical background.

ADDITIONAL REQUIREMENTS (LEVEL 11): Several years of research experience in mesoscale meteorology or related area. Publication record reflecting the quality and productivity of past research. Salary range: \$21,000–\$23,000 (LEVEL 1); \$23,000–\$25,000 (LEVEL 11). Note: The Scientist 1 and 11 appointments are in terms of up to three and four years respectively, with the possibility of extension to 11 or 11 positions.

Individuals may then be appointed to 11 or 11 positions in accordance with USAR policy. Send resume and references to: Dr. Klaus Jochims, NCAR, P.O. Box 3000, Boulder, CO 80507, or call (303) 494-5161, Ext. 261 or 666 for information. Equal Opportunity Employer.

Date	Time (UT)	Magnitude	Latitude	Longitude	Depth of Focus	Region
March 8	1707	5.9 m _b	10.88°N	02.08°W	99 km	Off NE Venezuela
March 12	0137	6.3 M _s	4.11°S	127.92°E	shallow	India Sea
March 15	1727	8.1 m _b	34.84°N	137.40°E	45 km	Honshu, Japan
March 18	0901	7.8 M _s	4.80°N	153.51°E	88 km	Solomon Islands
March 23	2351	6.0 M _s	38.57°N	20.60°E	10 km	W Greece
March 25	1158	9.1 m _b	35.96°N	52.33°E	shallow	N Iran
March 26	0407	5.3 m _b	36.17°N	52.17°E	shallow	N Iran
March 31	1313	5.5 m _b	2.43°N	76.03°W	10 km	SW Colombia

*University of California, Berkeley, magnitude 7.9

Information Contacts: National Earthquake Information Service, U.S. Geological Survey, Stop 967, Denver Federal Center, Box 25146, Denver, Colorado 80225 USA; P. Lowenstein, Senior Government Volcanologist, Raul Volcano Observatory, P.O. Box 386, Raul, Papua New Guinea; J. Rafael Gubernia, S.J., Universidad Javeriana, Inst. Geofísico, Cra. 7, No. 40-62, Apartado Aéreo 56710, Bogotá, D.E., Colombia; Islamic Republic

News Agency, Tehran, Iran; Agencia EFE, S.A., Madrid, Spain; United Press International.

Meteoritic Events

Meteorite Fall: Tennessee, USA, January 28; geographic information. Fireballs: East Germany; southern California, USA.

GFD Position/Texas A&M University. The Department of Oceanography of Texas A&M University has an opening for a tenure track assistant professor in physical oceanography to be filled by September 1983.

Preference will be given to candidates with strong theoretical background in geophysical fluid dynamics. The successful applicant will be expected to teach undergraduate and graduate courses and to conduct a vigorous research program in his or her specialty. A Ph.D. is required for this position and one year's experience in a postdoctoral position is desired. Salary is negotiable depending upon experience and qualifications.

Applicants should submit a vita along with a letter describing their research and teaching goals and names of five persons for reference to Professor R.C. Reid, Head, Department of Oceanography, Texas A&M University, College Station, TX 77843. The closing date for applications is May 31, 1983. Texas A&M University is an affirmative action equal opportunity employer.

Geology or Metamorphic Petrology. The Department of Geology seeks to fill a tenure track position in petrology beginning either August 15, 1983 or January 1, 1984. Appointment will be at the rank of assistant professor. Postdoctoral experience is considered an asset. The successful candidate will be expected to develop an aggressive research program, teach both graduate (Ph.D., M.S.) and undergraduate levels and interact with an active group of faculty and students in mineralogy, petrology, and geochemistry. Research facilities in the department include: automated electron microprobe, solid-state mass spectrometer, gas-source mass spectrometer, SEM, AA, non-instrumented XRF, and thin-section microscopy. Please send a resume, a statement of research interests and the names of at least three references to: Chairman, Petrology Search Committee, Department of Geology, Northern Illinois University, DeKalb, Illinois 60155.

Application will be accepted until position is filled. Northern Illinois University is an equal opportunity/affirmative action employer.

Research Positions for Mathematical Physicists. Applications are invited for several research positions at the Center for Studies of Nonlinear Dynamics, La Jolla Institute, beginning summer 1983. Current research involves work on nonlinear wave-wave interactions, acoustic, optical, and radio wave propagation in random media, and fluctuation phenomena in the statistical mechanics of chemical and geophysical systems. Physicists and applied mathematicians who are interested in working on problems of the above type should send resumes and arrange for three letters of recommendation to be sent to: Dr. Stanley S. Gelfand, Director, CSND, La Jolla Institute, 8955 Villa La Jolla Drive, Suite 2130, La Jolla, California 92037. La Jolla Institute is an equal opportunity/affirmative action employer.

UNIVERSITY OF GLASGOW DEPARTMENT OF GEOLOGY LECTURESHIP IN CRUSTAL SEISMOLOGY

Applications are invited for a new Lectureship in Crustal Seismology tenable in the Department of Geology from October 1983. The Department occupies a new 5 floor building, has 16 full-time and 3 part-time academic staff and is equipped with seismographs and other geophysical equipment.

Applicants should be not more than 38 years of age. Salary will be within the range 26375–31350 on the Lecturers' scale (under review) with planning according to age, qualifications and experience.

Further particulars may be obtained from the Secretary of the University Court, (Room 18), University of Glasgow, Glasgow G12 8QQ with whom applications (8 copies), 1 copy in the case of overseas applicants, giving the names and addresses of three referees, should be lodged on or before 20th May, 1983. Late applications from overseas will be considered; telegrams in the first instance if necessary.

In reply please quote Ref. No. 4885.

